CLAIMS

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What is claimed is:

- 1 1. A method for temporarily assisting a heart of a patient, the patient wearing ECG sensors with attached electrodes, the method comprising the steps of:
 - a. inserting an occluding device, having a pressure sensor, into the patient's descending aorta;
 - b. positioning the occluding device near the level of the patient's diaphragm;
 - c. coupling the occluding device to an extra-corporeal controller; and
- d. opening and closing the balloon in response to signals from the ECG electrodes.
- The method of claim 1, wherein the step of closing occurs just prior to the start of cardiac systole and ventricular ejection.
- The method of claim 2, further comprising the step of using an extra-corporeal pump to continuously pump blood from a patient's supra-diaphragmatic artery to an infra-diaphragmatic artery.
- The method of claim 3, wherein in the step of continuously pumping blood, the pumping flow rate varies in response to the end-systolic pressure measured in the upper arterial compartment of the patient's body.
- The method of claim 4, wherein the extra-corporeal controller a) causes the occluding device to intermittently occlude the aorta, synchronously with the patient's cardiac cycle, and b) causes the extra-corporeal pump to pump blood from the patient's proximal to the distal aorta at a rate sufficient to pressure and volume unload the patient's failing left ventricle.

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- 1 6. The method of claim 5, wherein the extra-corporeal controller decreases the flow rate and RPM of the extra-corporeal pump when it opens the occluding device.
- The method of claim 6, wherein an inlet cannula of the extra-corporeal pump is inserted through an aortic valve into the left ventricle, the inlet cannula having holes along a length of it positioned in the aorta, and a hole in a tip, which is positioned in the left ventricle, for providing direct unloading of the left ventricle, and after-load reduction in the aorta.
- A method for temporarily assisting a heart of a patient, the patient wearing ECG sensors with attached electrodes, the method comprising the steps of:
 - a. inserting a balloon, having a balloon catheter and two pressure sensors, into the patient's descending aorta;
 - b. positioning the balloon near the level of the patient's diaphragm;
 - c. coupling the balloon catheter to an extra-corporeal controller;
 - d. inflating the balloon in response to signals from the ECG electrodes, and the two pressure sensors; and
 - e. deflating the balloon in response to signals from the ECG electrodes, and the two pressure sensors.
- The method of claim 8, wherein the step of inflating occurs just prior to the start of cardiac systole and ventricular ejection.
- 1 10. The method of claim 9, further comprising the step of using an extra-corporeal pump to continuously pump blood from a patient's supra-diaphragmatic artery to an infra-diaphragmatic artery.
- 1 11. The method of claim 10, wherein in the step of continuously pumping blood, the pumping flow rate varies in response to the end-systolic pressure measured in the upper arterial compartment of the patient's body.

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- The method of claim 11, wherein the extra-corporeal controller a) causes the balloon to intermittently occlude the aorta, synchronously with the patient's cardiac cycle, and b) causes the extra-corporeal pump to pump blood from the patient's proximal to the distal aorta at a rate sufficient to pressure and volume unload the patient's failing left ventricle.
- 1 13. The method of claim 12, wherein the extra-corporeal controller decreases the flow rate and RPM of the extra-corporeal pump when it deflates the balloon.
- 1 14. A method for temporarily assisting a heart of a patient, the patient wearing ECG sensors with attached electrodes, and the patient also having an intra-aortic occluding device having two pressure sensors, the method comprising the steps of:
 - a. opening and closing the intra-aortic occluding device by an extra-corporeal controller in response to signals from the ECG electrodes and the two pressure sensors; and
 - b. continuously pumping blood by an extra-corporeal pump from a patient's supra-diaphragmatic artery to an infra-diaphragmatic artery
- The method of claim 14, wherein the step of closing occurs just prior to the start of the patient's cardiac systole and ventricular ejection.
- The method of claim 15, wherein the pumping flow rate varies in response to the end-systolic pressure measured in the upper arterial compartment of the patient's body.
- The method of claim 16, wherein the extra-corporeal controller a) causes the occluding device to intermittently occlude the aorta, synchronously with the patient's cardiac cycle, and b) causes the extra-corporeal pump to pump blood from the patient's proximal to the distal aorta at a rate sufficient to pressure and volume unload the patient's failing left ventricle.

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- 1 18. The method of claim 11, wherein the extra-corporeal controller decreases the flow rate and RPM of the extra-corporeal pump when it opens the occluding device.
- 1 19. A method for temporarily assisting a heart of a patient, the patient wearing ECG sensors with attached electrodes, and the patient also having an intra-aortic balloon having two pressure sensors, the method comprising the steps of:
 - a. inflating the intra-aortic balloon by an extra-corporeal controller in response to signals from the ECG electrodes and the two pressure sensors;
 - b. deflating the intra-aortic balloon by an extra-corporeal controller in response to signals from the ECG electrodes and the two pressure sensors; and
 - c. continuously pumping blood by an extra-corporeal pump from a patient's supra-diaphragmatic artery to an infra-diaphragmatic artery.
- The method of claim 19, wherein the step of inflating occurs at the onset or during the patient's cardiac systole and ventricular ejection.
- The method of claim 20, wherein the pumping flow rate varies in response to the end-systolic pressure measured in the upper arterial compartment of the patient's body.
- The method of claim 21, wherein the extra-corporeal controller a) causes the balloon to intermittently occlude the aorta, synchronously with the patient's cardiac cycle, and b) causes the extra-corporeal pump to pump blood from the patient's proximal to the distal aorta at a rate sufficient to pressure and volume unload the patient's failing left ventricle.
- The method of claim 22, wherein the extra-corporeal controller decreases the flow rate and RPM of the extra-corporeal pump when it deflates the balloon.

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